

309 SEWER MANHOLES

309.01 DESCRIPTION

Work consists of excavation, backfill and compaction beyond trench pay limits, furnishing and placing manholes complete, either over existing or new sewers, including concrete base and manhole frames and covers. Manhole riser shall, in general, be constructed of precast concrete elements unless otherwise specified. Brick masonry may be used in lieu of precast riser units for conditions as approved by the Engineer.

309.02 SUBMITTALS

Shop drawings per 105.02 shall be submitted for precast risers, cast-iron frames and covers.

309.03 MATERIALS

Reinforcing Steel - 812.02, Grade 60

PCC - 817, Class B

Manhole Bases - Unless otherwise specified, manhole bases shall be precast or cast-in-place reinforced PCC, set on a minimum six (6) inch depth of compacted gravel on undisturbed material. An acceptable steel ring form shall be used to form a groove for the tongue of the bottom precast riser section.

Inverts - Invert channels shall be formed of brickwork and/or Class B PCC conforming to the adjoining pipe sizes. Invert sides shall be smooth curves with longest possible radius tangent to adjoining pipe center lines. Depths of smaller pipes shall match 0.8 depth of the main pipe. A one inch wash shall be provided from the inside edge of the manhole base to the edges of the shaped channels.

Precast Concrete Risers - 821.04

Manhole Brick - 806.01(A)

Manhole Steps - 821.07

Compression Seals - 807.06(B)

Manhole Entry Seals - 808.04

Mortar - 806.05(B)(4) and (5)

Manhole Frames and Covers - 815.04

Nonshrink Grout - 806.05(F)

309.04 CONSTRUCTION REQUIREMENTS

(A) MAINTAINING SEWER SERVICE. Existing sewer service shall be maintained at all times. The Contractor shall conduct his operations so as to maintain flows in existing sewers through the project area. This will require proper coordination between construction replacement or abandonment so as not to block existing sewers that are to remain in service.

When it is necessary to pump sewage while replacing and installing manholes, the material pumped shall

be carried by means of an approved hose or other closed, watertight conveyor to the downstream sewer or manhole designated by the Engineer. Sewage shall not be allowed to flow onto or over the street surface. Overtime, weekend, and holiday work may be required at no additional District cost to promptly complete temporary and/or permanent sewer service.

(B) EXCAVATION/BACKFILL. Excavation for manholes over all sewers shall be extended as needed beyond trench limits, and the excavation shall be maintained and shored as necessary for proper construction. After the manhole is complete and concrete and paving have cured, the remaining excavation shall be backfilled per 207; the portion of backfill beyond trench limits shall be included as part of Sewer Manhole work. For manholes over existing sewers, all excavation shall be included as part of Sewer Manhole work.

(C) CONCRETE MANHOLE SECTIONS. Manhole bases shall be precast or cast-in-place reinforced concrete, set on a firm foundation. Flow channels and benches shall be shaped with brick; or concrete may be used as needed, with brick facing. Bases for new manholes shall be precast with base riser cast integral with base slab.

Manhole steps shall be built into the walls of manhole bases as shown in the contract documents, with step legs embedded 3-3/8 inches into the concrete. Before press-fitting steps into inserts or drilled holes, concrete must have attained 2,500 psi minimum field strength.

When constructing a new manhole over an existing sewer, the manhole base shall be constructed around the existing sewer before cutting the sewer. Precast concrete riser with doghouse openings cast in the lower end shall be used as a base riser and fitted over existing pipe, except over PVC pipe.

Riser and base sections shall have cast or augered cut-outs of the required diameter for connections and outlet pipes; maximum size of cut-outs shall be equal to the outside pipe diameter plus four (4) inches. A clearance of at least nine (9) inches of concrete shall remain between adjacent connection and outlet pipe holes and between riser joints and holes in precast risers and bases. Lesser clearance will be considered only if additional reinforcing steel is provided and details are submitted for approval.

For manholes on sanitary and combined flow sewers 24-inches and smaller diameter, the Contractor shall install a lubricated, rubber gasket entry seal into the manhole wall to effect a watertight connection between the connecting sewer pipe and the manhole.

Entry pipes shall be cut flush with the inside wall of the manhole.

Two-inch diameter lifting holes spaced 180 degrees apart are permitted provided PVC or rubber plugs are installed to make manhole watertight after installation.

Manhole risers shall be constructed of precast concrete elements where feasible, otherwise of brick masonry. Risers and cone tops shall be furnished with manhole steps 12 inches on center. Manhole steps shall be aligned on vertical section of sidewall having no pipe entry, with step legs embedded 3-3/8 inches into the concrete.

Manholes shall have a precast slab or eccentric cone top with proper size access hole to accommodate the required frame and cover. Brick masonry shall be used to adjust the frame and cover to approved grade. Not more than 18 inches of brick shall be used unless approved by the Engineer.

(D) BRICK MANHOLE SECTIONS. Manhole brickwork shall be plumb except for the eccentric top section, true to line with level and accurately spaced courses, with each course breaking joint with the course

below. Joints shall not be less than 3/8 inch nor more than 1/2 inch with a minimum of one header course to every six (6) stretcher courses. Each brick shall be placed with a full joint in a full bed of mortar, shoved up against adjacent brick so that the mortar rises between and completely fills vertical joint. Exterior surfaces of brick manholes shall be completely coated with a 1/2 inch mortar parging and made watertight. Brick masonry walls shall be nine (9) inches thick; thickness shall be increased to 13 inches when manhole depth exceeds 15 feet.

Brick masonry shall not be placed when the ambient air temperature is below 40 deg. F and when it appears probable that temperatures below 40 deg. F will be encountered before mortar can set, unless adequate approved means are provided for protecting the work from freezing. Work shall be protected by heating and maintaining the temperature of the masonry materials at not less than 40 deg. F on both sides of the masonry for not less than 72 hours. Work with, or on, frozen materials is prohibited.

During hot weather, masonry shall be protected from direct rays of the sun. All finished work shall be covered and kept damp for a period of seven days after placement.

Mortar shall be freshly mixed for prompt use; no mortar shall be used after setting or beyond one hour after the addition of water. Retempered mortar and freeze preventive chemical additives are prohibited. The mixing machine, batch size, and mixing time shall be approved by the Engineer. When hand mixing is done, mixing shall be accomplished in a clean, leakproof, nonporous mortar box constructed for the purpose.

Proper size manhole steps shall be aligned on section of sidewall that is vertical to frame and cover, with step legs embedded 7-3/8 inches into the brickwork.

The Contractor shall furnish manhole frames drilled with two 3/4-inch diameter holes, 180 degrees opposed in frame flange. With frame in proper position at required grade, corresponding holes shall be drilled with a minimum of two (2) inches into the brick masonry upon which the frame sits. Steel dowels shall be inserted through these holes to prevent lateral movement of frames during backfill and paving operations. Dowels shall be No. 5 rebars, three (3) inches minimum length, or approved equivalent. A mortar bed shall be constructed around the frame flange.

Excavation shall be backfilled per 207.06.

(E) COMBINED CONCRETE/BRICK SECTIONS. Where approved by the Engineer, manholes may be constructed from a combination of precast sections, brick masonry, and cast-in-place reinforced concrete. At the point where the different materials join, a watertight joint shall be provided that leaves interior walls straight and smooth.

(F) FIELD CUT PIPE ENTRY OPENINGS. Field cuts in concrete sections of manholes shall be accomplished with proper tools. Unless otherwise approved, the outline of the proposed hole shall be clearly marked and shall be line drilled not more than five (5) inches apart. The hole shall be made smooth to receive the pipe entry seal and the pipe. Pipe entry seals shall be used when connecting a proposed sanitary or combined sewer of 24-inches and smaller diameter to an existing manhole. Non-shrink mortar shall be used to fill the void between entry seal and pipe. For storm sewer connections made in the field, the annular space around the connection pipe shall be filled with nonshrink mortar. Field cut entry holes will not be permitted in proposed manholes unless approved.

When precast manhole bases are used for sanitary or combined sewer applications, an approved resilient entry seal shall be cast in the base during manufacture.

Pipe entry holes in brick sections of existing manholes shall be made by carefully removing sections of brickwork.

(G) REPLACE MANHOLE INVERT. Work consists of removing and replacing inverts in existing manhole to redirect sewage flow. New invert shall be per 309.03.

309.05 MEASURE

The unit of measure for manholes on sewers 48-inches diameter or less will be the vertical linear foot, with measure taken from sewer outlet invert to top of frame for manholes over existing or new sewers.

The unit of measure for manholes on sewers larger than 48-inches diameter will be the vertical linear foot, with measure taken from the top of the concrete base to the top of frame.

The unit of measure for the complete reinforced concrete base for manholes on sewers larger than 48-inches diameter will be each.

The unit of measure for replacing manhole invert will be each.

309.06 PAYMENT

Payment for Precast Sewer Manhole and Brick Sewer Manhole will be made at the respective Contract unit price per vertical linear foot, which payment will include excavation, shoring and backfill beyond trench pay width for manholes over new sewers; excavation, shoring and backfill for manholes over existing sewers; furnishing and placing precast or cast-in-place reinforced concrete manhole base on all sewers 48-inches diameter or less, precast or brick manhole risers, precast reinforced concrete slab or eccentric cone top, brick masonry to adjust manhole frames and covers to correct grades; furnishing and placing manhole frames and covers, furnishing and placing manhole steps, maintaining sewer service, and all labor, materials, tools, equipment and incidentals needed to complete work specified.

Payment for Reinforced Concrete Base for sewer manholes on sewers larger than 48-inches diameter will be made at the contract unit price per each, which payment will include excavation, shoring and backfill beyond trench pay width for manholes over new sewers; excavation, shoring and backfill for manholes over existing sewers; furnishing and placing reinforced concrete manhole base; furnishing and placing pipe that protrudes into the manhole base; furnishing and placing manhole steps; maintaining sewer service, and all labor, materials, tools, equipment and incidentals needed to complete work specified.

Payment for Replace Manhole Invert will be made at the Contract unit price per each, which payment will include removal of existing invert, reshaping new invert, disposal of unusable materials, and all labor, materials, tools, equipment and incidentals needed to complete work specified.